FOG IN THE OHIO VALLEY [1]

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When it became necessary for the city of Cincinnati to decide on the location for a new municipal airport, it became more evident than ever that the fog data for the region along the Ohio River were not as full and complete as needed. It was generally known that fog occurred more frequently along the river than on the hilltops, but the exact excess and the conditions under which the river fogs formed were not known.

Before the day of the airplane the information was needed for river transportation and other purposes, but the river boat can tie up while the fog prevails, while the plane can not tie up to a cloud.

There are a large number of river stations in the Ohio Valley and at most of them fairly complete weather as well as river reports are maintained. Fifty of these river stations are at the locks and dams on the Ohio River, where Federal employees are on duty at all times. Through the cooperation of the United States engineers, arrangements were made to keep a record of the time of beginning and ending of all dense fogs at the river stations. The time of the fogs as well as the time of precipitation is telegraphed or telephoned to the Cincinnati station from the river stations.

The stations at and in the immediate vicinity of Cincinnati are favorably located to make a study of fogs at various elevations. The older office of the Weather Bureau in the downtown section of the city is still maintained as a point of observation. This is located a few blocks from the river, the elevation is about 100 feet above the river bank, and the site is practically surrounded by hills from 200 to 300 feet higher. The Abbe Meteorological Observatory is on the hilltop, about 4 miles from the river and near the center of the city. The lock and dam known as Fernbank is on the bank of the river about 10 miles below the Federal Building, but within the city limits, while Dam No. 36 is about an equal distance upstream from the Federal Building. All the other river stations are on the banks of the river, but some are located in open country, while others are partially surrounded by hills of various slopes and heights.

At the principal station of the Weather Bureau in Cincinnati dense fog has been recorded 461 times in the last 37 years or on an average of 12½ days per year. Of these fogs, 92 or 25 per cent have occured in October, about 15 per cent during each of the months from September to February, inclusive, and only a few during the summer months. Most of these fogs might be called general fogs to distinguish them from river or valley fogs.

From a year's record of the fogs at the river stations it is indicated that the valley fog will occur on 15 to 20 days during the year in addition to the days with general fog. However, occasionally the general fogs do not settle into the valleys, but rest only on the higher ground. The valley fog occurs more frequently during the summer than the winter months, just the reverse of the general fogs.

The true valley fog forms from one to three hours after midnight and burns up an hour or two after sunrise. The weather, of course, is usually clear above the fog. The fog usually forms near to or just to the south of the center of an area of high pressure. Rain falls within the previous 12 hours over the region just south of the Ohio Valley. The gentle flow of the cool air from the north mixes with the comparatively warm humid air in the valleys along the northern edge of the rain area. The gradient must be gentle and the wind light or the fog will not form. Under the most favorable conditions fog will form along the entire length of the Ohio River, nearly 1,000 miles, and also in the valleys of the tributaries across Kentucky and West Virginia.

The valley fog will also form in the Ohio Valley, but over limited areas, along the wind shift line of a shallow trough of low pressure extending from the Great Lakes southwestward. This occurs only when the overflow of the cool northwest wind is not sufficiently strong to produce general precipitation.

A shallow area of low pressure moving in from the west with a strong high to the north or northeast will form fog on the northeast or east side of the center of lowest pressure, but this is a general fog and frequently will not form in the valleys. A slight circulation of the wind within an area of high pressure may produce fog on the hilltops, but not in the valleys. Such a case occurred between Cincinnati and Louisville the evening of December 9, 1929. When the mail pilot left Louisville the ceiling was 600 feet, and at the airport at Cincinnati and the two river stations between the ceiling was 400 to 500 feet, but a slight circulation of wind over the region caused such a dense fog or low cloud over the hills in Kentucky near Cincinnati that the pilot had to return to Louisville.

From the hilltops at Cincinnati one can look across a sea of fog in the valley, and other hills 5 miles or more away are plainly visible. As the wind begins to increase in velocity the fog is packed against the side of the hills and into the pockets, refusing at first to rise over the hills; when the wind becomes sufficiently strong the fog streams over the hills as great rivers, always following fairly well-defined channels. In a distance of 2 miles from the Abbe Observatory toward the business section of the city and the Ohio River and along a fairly level street one will occasionally pass through three streams of very dense fog about one third mile broad. These rivers of fog follow quite definite courses.

Fogs are the greatest obstacle that the airplane has to overcome in the Ohio Valley. The valley fog interferes with the landing of the plane, but is not a serious obstacle to the take-off. The mail plane due at Louisville at 5 a. m. from Cleveland frequently has to wait at Cincinnati or elsewhere for the fog to disappear at Louisville, but the Chicago plane from Cincinnati leaves the local airport in a valley fog if other conditions are favorable.

Fogs can be forecast about the same as any other weather phase if information about the same is collected by telegraph. With our present method of reporting observations, fog is reported only when it occurs at the Weather Bureau station and at the time of observation. We have had reports of dense fogs at as many as 20 stations in the Ohio Valley when the Washington weather map did not show a single fog and only meager information was sent to the airway control stations at Chicago and Cleveland. The two latter stations make flight forecasts for planes going into and out of the Ohio Valley, and the district forecaster at Washington makes a flying weather forecast for zone 5, the Ohio Valley.

[1] Presented before American Meteorological Society, Des Moines, Iowa, Dec. 28, 1929.